FALL 2014

THE SAFETY SIGMA

QUARTERLY NEWSLETTER OF THE NAVAL SCHOOL OF AVIATION SAFETY

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THE GOOD, THE BAD, AND THE UGLY OF FY14

CAPT JODY "CAVEMAN" BRIDGES, USN—SAS DIRECTOR

Another fiscal year and a new blank slate of mishap stats arrived in October. What will the stats be on September 30th of 2015? Will we be looking at a banner year, with the lowest mishap rate in Navy Aviation, like September 30th of 2013? Will Naval Aviation have a good year in mishap reduction in FY15. What will that chart look like in 10 months? How much readiness will be lost to the "Blue threat"? Will all of our fellow squadron mates be with us? If we want the answers to be in the affirmative we need to remember the principles of proactive safety cultures. To prevent mishaps we must have ROBUST practices, DEDICATED people and BUY-IN from every corner of the enterprise. Having a good year in safety does not happen by simply willing it to be so. We must all be committed to it, act on it and live it every day.

So what is ROBUST practice? First, we must identify hazards, know what bit us in the past and ensure we have dedicated processes in place to manage risk. So let us take a hard look at that "you son of a b*tch" (must be said in the tone of voice of Lily Aldrin from "How I Met Your Mother") year of FY14.

(Continued on the last page).....

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TRUTH IN REPORTING

CDR JEREMY "RICKY BOBBY" NILES, USN

Too often, it seems, we wait until there is a Class A to effect change to prevent future mishaps. Why is that? Is it that there were no warning signs? Or did we just not pay attention to what we were seeing? Did we think it was not a big enough deal to spend the time on? Why don't we report before the Class A mishaps, or when we do, why don't we always detail constructive factors or recommendations? While the reporting culture varies from community to community, the overarching culture is characterized by aviators who are "can do" people and take responsibility for our actions when we make mistakes.

Mistakes are what cause most mishaps. Skill-based errors and judgment/decision-making errors are the all-too-common causes of mishaps, but they are just the "tip of the iceberg" when it comes to *why* mishaps happen. It is too easy to say the Mishap Pilot (MP) failed. Most of the time, the MP will be the first to say, "I screwed up." While it may be true that the MP executed incorrectly or made a poor decision, it does not get to the root of the problem. We need to ask ourselves, "if we remove and replace MP (maintainer, controller, MWSO, MCC, etc.) could this happen again?" If the answer is yes, and most of the time I think it is (if you have taken my class, then you know half of you are below average), then we must look beyond the individual's act and at the system that allowed that act to occur. This is looking below the surface at the latent failures that exist all of the time. Some of these failures may have been around for years or even decades and never (next)

"We must look beyond the individual's act and at the system that allowed that act to occur."

(from previous page) materialized, but they are setting the stage for mishaps to unfold.

Naval Aviation as a whole does a good job at looking for the latent failures (pre-conditions, supervisory, and organizational influences) during Class A mishaps, but fails to do the same on lower level mishaps and HAZREPs. Is this because the resultant wasn't bad enough for me to tell my boss s/he failed? Does the CO not want to call out his/her boss? Does my boss not want to admit the failure to the rest of the community? There are times when mishap reports don't even get done for this reason or due to influence from higher in the COC. They are swept under the proverbial rug. We have all heard of the magical mathematicians, who somehow turn an engine into a $19K part. Is this helping the Navy and Marine Corps or serving someone's ego who doesn't want a mishap on their record, in their squadron, or in their MAG/CAG/Wing/etc, when in actuality a mishap did happen?

When we underreport or fail to report mishaps and hazards we are underserving our communities and our people. Like all of us in our daily lives, leaders must prioritize their resources (time, money, etc).

Underreporting does our leaders a disservice by misinforming them regarding the amount of risk involved with certain events. It is up to each of you to help create reporting cultures across each of your communities to ensure we are capturing the hazards that we are confronting every day. It is equally important for ASOs and Commanding Officers to capture the factors that lead to these hazards and formulate useful recommendations that will eliminate or mitigate the risk of those hazards. This all starts with "truth in reporting."

COLLATERAL DUTIES OR COLLATERAL DAMAGE?

AWOC (NAC/AW) TREVOR GODWIN, USN

We hear it a thousand times over that it's up to us to prevent the next mishap. So I propose this question. Are collateral duties impeding your primary mission and focus on safety?

We run various emergency drills and staged training on numerous situations. However, our primary thoughts are on what reports, budgets, and meetings are due next. Recently we met a member with three heavy collateral duties to include NATOPS officer, Assistant Training Officer, and CRM Unit Level Manager. How many collateral duties does it take to conflict with your primary duty as a Pilot, NFO or Aircrew? Well, that is up to you.

Information processing is different for everyone. However, the flow and retention is arguably the same. Sensory information is fed through touch, sight, and sound. Then it matriculates to your working memory which last only for a short duration. Research shows that many individuals' short term memory lasts approximately 18 to 20 minutes (Miller, 1956). Items in your short term memory only progress to your long term after a repetition or considerable reviewing. They can be overrun or lost in critical situations if a higher priority demands more focus (e.g. end of the month training reports, upcoming deployment schedule, and/or country clearance requirements). We recommend that these long term memory barriers be combated with weekly primary duty training and detailed preflight reviews. Another excellent tool to reinforce the importance of primary duties is appropriate (next page)

IF YOU ARE INTERESTED IN CONTRIBUTING TO A FUTURE ISSUE OF THE "SIGMA", PLEASE CONTACT THE EDITOR AT JAMES.A.BATES3@NAVY.MIL

"Are collateral duties impeding your primary mission and focus on safety?"

(from previous page) level workload sharing.

Situational Awareness refers to the degree of accuracy by which one's perception of his current environment mirrors reality. For example, a small tree just got really BIG or fuel indicators for tanks 1 and 2 are reading lower than expected. Situational Awareness is critical to proper analysis and Decision Making. The review of 175 aviation mishaps revealed that poor Situational Awareness (a human error) was the primary cause of 154 (88%) aviation mishaps (Okray & Lubnau, 2004). Some of the members were lead instructors, evaluators, Commanding Officers, NATOPS Officers, Training Officers, or senior enlisted personnel who were unaware of an impending issue or possible solutions. Your Situational Awareness knowledge and Decision Making abilities can keep a multi-million dollar platform operational, repairable or recyclable. Round table conversation on experiences, weekly training on community mishap reports, and mock NATOPS exams are only a few suggestions from the fleet. Crew Resource Management and Operational Risk Management should NOT be discussed only in the last five minutes of an evaluation. It should be a constant in every sortie of every day.

I urge each aviator to take a step back and look at the big picture. I challenge you to set aside personal study time to reinforce your long term memory. Make sure to attend the weekly training, review new updates, read recent HAZREPs, and research your Type/Model/Series community trends. These few steps are a great way to maintain your personal health (i.e. staying alive). Research has shown that the illusion of retention will be tested and tried during an actual emergency. This is your opportunity; do not allow multiple collateral duties to cause collateral damage.

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Miller, G. (1956) The Magical Number Seven, Plus or Minus Two: Some limits on our capacity for processing information, Psychological Review, 63, 81-97.

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DIETARY SUPPLEMENTS

CAPT JACK "BAGS" WYLAND, USN

Here at the School of Aviation Safety, I give an assignment that asks the ASO students to write a paper on any section of OPNAVINST 3710.7U Chapter 8 (Aeromedical and Survival) that they feel strongly about. The section on Nutritional Supplementation (8.3.2.3.1) typically ranks 3rd or 4th in number of papers I receive. This tells me that many of you recognize that the use of these products remains a significant issue in Naval and Marine Corps aviation. What many of you do not know though is that the Nutritional Supplements section of the Naval Aerospace Medical Institute (NAMI) Waiver Guide (referenced in OPNAVINST 3710.7U) was completely revised in 2013. I still receive questions as to why aviators cannot use products such as creatine and melatonin, two products that are now approved for use once some simple documentation has been completed.

A dietary supplement is defined by the FDA as "a product intended for ingestion that contains a dietary ingredient intended to add further nutritional value to (supplement) the diet". Prior to using supplements, individuals should be aware of a few issues. Safety and/or effectiveness of the ingredients have not been "proven" for many of the commercially available products. There are no regulated manufacturing standards in place for supplements thus the potential for inaccurate labeling or product contamination exists. Interaction with other supplements or medicines has been documented in numerous cases. Finally, misuse including megadosing rapidly elevates the associated risks. A clear example of how improper supplement use can impact safety of flight can be found on WESS at: https://wess.safetycenter.navy.mil/collective/mil.navy.safecen.collective.Collective/servlet/pdfProducer?mdr=false&key=av-hazard&hint=4dd588594156ef330141755a6ce17551

There are many thousands of supplements on the market and approximately 50% of Americans use some type of supplement [1] at a total cost of approximately 15 billion dollars per year [2]. Given the high number of products on the market, it would be extremely difficult to establish an all-inclusive list of supplements for use in Naval Aviation. NAMI does, however, understand that a significant number of aviators are interested in using supplements in their pursuit of optimal performance. While not all-inclusive, the NAMI waiver guide is a concise, scientifically based product covering the most relevant over-the-counter supplements that are often considered for use by aviators.

The current guidelines in the waiver guide are specific and easy to understand. In essence, they require aviators to discuss the value, limits and risks of supplement use with a designated aeromedical officer prior to use. The guide goes into more detailed discussion than this limited space format allows. As in the past, there are three classes of supplements: Class A, B and C. Class A supplements are substances for which there is strong evidence of safety and/or efficacy. They are approved for flight following simple discussion and documentation.

(from previous) These include sports drinks, protein products, vitamins and minerals, and caffeine. Some of these supplements have specific limits related to their use which can be found in the waiver guide. Class B supplements are substances for which evidence of risk is minimal. They are also approved for flight but require some additional, yet still basic information. These include glucosamine, saw palmetto, creatine, melatonin and ginger. As with Class A supplements, some of these too have limits that can be found in the waiver guide. Class C supplements are substances for which the potential risks outweigh any proven or perceived benefit and thus are prohibited for flight. They include everything not previously listed as Class A or B. Of particular note, energy drinks fall into the Class C category and are prohibited as there is some research that indicates that these products may actually hamper pilot performance.

The proper use of proven nutritional supplements remains an option for those aviators seeking optimal performance. Knowing which products are approved and understanding the specific factors related to their use is imperative for both health and professional reasons. Additional information on supplement use can be obtained through your aeromedical staff, found in the NAMI waiver guide:
http://www.med.navy.mil/sites/nmotc/nami/arwg/Pages/AeromedicalReferenceandWaiverGuide.aspx
and at the Department of Defense's Human Performance Resource Center website http://hprc-online.org

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When you need to fill white space in a newsletter with something beautiful, a section of CH-46Es is always a safe bet! *U.S. Marine Corps photo by Lance Cpl. Ryan Carpenter.*

"Energy Drinks fall into the Class C category and are prohibited as there is some research that indicates that these products may actually hamper pilot performance."

IN-FLIGHT ICING

LT MARK "MILK" DEMANN, USN

As the cold season rapidly approaches it is important to take a step back and prepare for the unique hazards we may encounter. One of those hazards is in-flight icing. Flight in icing conditions, even with aircraft that have anti-ice or de-ice equipment, is not recommended and it's important to understand how to avoid icing conditions through proper preflight planning. However, if we do encounter icing it is also important to have a good grasp of how it affects the aerodynamic performance of the aircraft – not only to understand how best to recover from such an event, but also to understand the cues indicating the aircraft is in an unsafe situation.

Simply put, ice accumulation on the aircraft has a significant impact on the lift and drag qualities of the aircraft (along with other systems such as engine inlets, propellers, pitot-static systems, antennas, etc.). First, the additional drag can be substantial. The added weight, form drag, and skin friction drag can increase the total drag on the aircraft up to 100%, possibly even 200% in some extreme cases. This is where icing cues can be very important. The increase in drag will cause higher thrust/power requirements to maintain a given airspeed. It is important to have a good understanding of typical power settings for given phases of flight corresponding to specific airspeeds so that icing performance degradation can be assessed quickly. Also, as the ice builds over time the drag will continue to increase, therefore driving more and more thrust/power required to maintain a given airspeed. Sometimes the degraded performance is realized only because of the continued requirement to add power to maintain airspeed. If power is not added, the steady increase in drag will cause a steady decrease in airspeed which can lead to high angle of attack and controllability issues.

To understand the effects on lift it is important to review how lift is generated in the first place. The lower pressure on the top surface of the wing relative to the bottom creates the upward force we define as lift. This lower pressure is created by the increased velocity of the airflow as it accelerates around the leading edge / forward portion of the wing – thank you Bernoulli. Understanding this concept, it is easy to see that the pressure drop creating the lift we enjoy so much is mostly generated on the forward portion of the wing or airfoil as the air accelerates around the leading edge. Therefore, the leading edge can easily be considered the most important part of an airfoil when referring to the generation of lift. When ice forms on the surface of the aircraft it prefers locations that are small, narrow, or thin. It also will form best at stagnation points (where the local air velocity is zero). The leading edge of the wing creates a nice stagnation point for ice to form and thin, sharp wings (such as may be used for the horizontal stabilizer) generate even more ice on the leading edge. Since the leading edge is so important to the generation of lift, even small amounts of ice that attach to it substantially change the lift characteristics of the wing. The production of lift is reduced, having the most impact at higher angles of attack. The wing C_{Lmax} and stall AOA are both significantly reduced, resulting in increased stall speeds. How much, or how significant is this? Depending on the amount and type of ice, as well as the aircraft design, approximately 30% reduction in C_{Lmax} is reasonable. This corresponds to about a 20% increase in stall speed. The ice buildup on the leading edge has essentially the same aerodynamic effect as a stall strip. A stall strip is designed to stick out into the airflow from the leading edge, trip the flow, and cause separation/stall at a lower angle of attack. Attaching ice to the leading edge basically does the same thing, only to the entire span of the wing.

The terms "approximate" and "about" used above are important because, bottom line, flying that aircraft, you don't know the extent of aerodynamic performance degradation due to icing. NATOPS stall speeds, stall AOA, etc. all go out the window at this point.

Aerodynamically, once in icing the best way to combat the degraded performance is to maintain a low angle of attack (high airspeed) to stay as far away from stall as possible and reduce the effects of ice on C_L . Keep in mind, in cruise flight where the aircraft is typically operating at a low angle of attack / high airspeed to begin with, the aircraft may seem to perform well even with ice accumulating on the leading edge of the wing. However, as you slow and configure on approach the aircraft may be in an extremely hazardous condition and could easily stall well below expected stall angle of attack. Also, depending on your specific T/M/S system, oftentimes the typical stick shaker / stall warning device on your aircraft will not warn you of this type of stall (because the aircraft is stalling at a lower AOA than what it was designed to). In addition to the (next)

(from previous) changes in lift and drag, icing can also have a substantial impact on the controllability of the aircraft. For example, as mentioned earlier, ice tends to accumulate at stagnation points and especially around thin, narrow objects. Many aircraft wings are designed to be thinner near the wingtips and thicker at the wing root. Therefore the ice has a tendency to develop at the wingtips first and foremost. This causes air flow separation at the tip, in front of the ailerons, reducing their effectiveness and even possibly causing the wingtip to stall first making control in the impending stall extremely difficult.

There are numerous examples – HAZREPS, mishaps, civilian and commercial accidents – that all highlight the dangers of in-flight icing. Understanding the effects icing has on the aircraft, realizing the dangers present, and how to get out of the situation safely, is paramount to every aviator. This is an area that a little review and training can go a long way to avoid the next icing mishap. There are numerous references that discuss all the aspects of icing as it applies to aviators. NASA offers free online training through the NASA Glenn Research Center at: http://aircrafticing.grc.nasa.gov/ . Also, following some devastating commercial mishaps, the FAA released an Advisory Circular (AC 91-74A) that has excellent information regarding icing conditions in flight. There are numerous resources at our disposal to continue to train to be as prepared as possible in the unfortunate event we encounter a dangerous icing situation.

WHO *ELSE* IS INTERESTED IN OUR HAZARDS?

LT JIM "PUGSLY" BATES, USCG

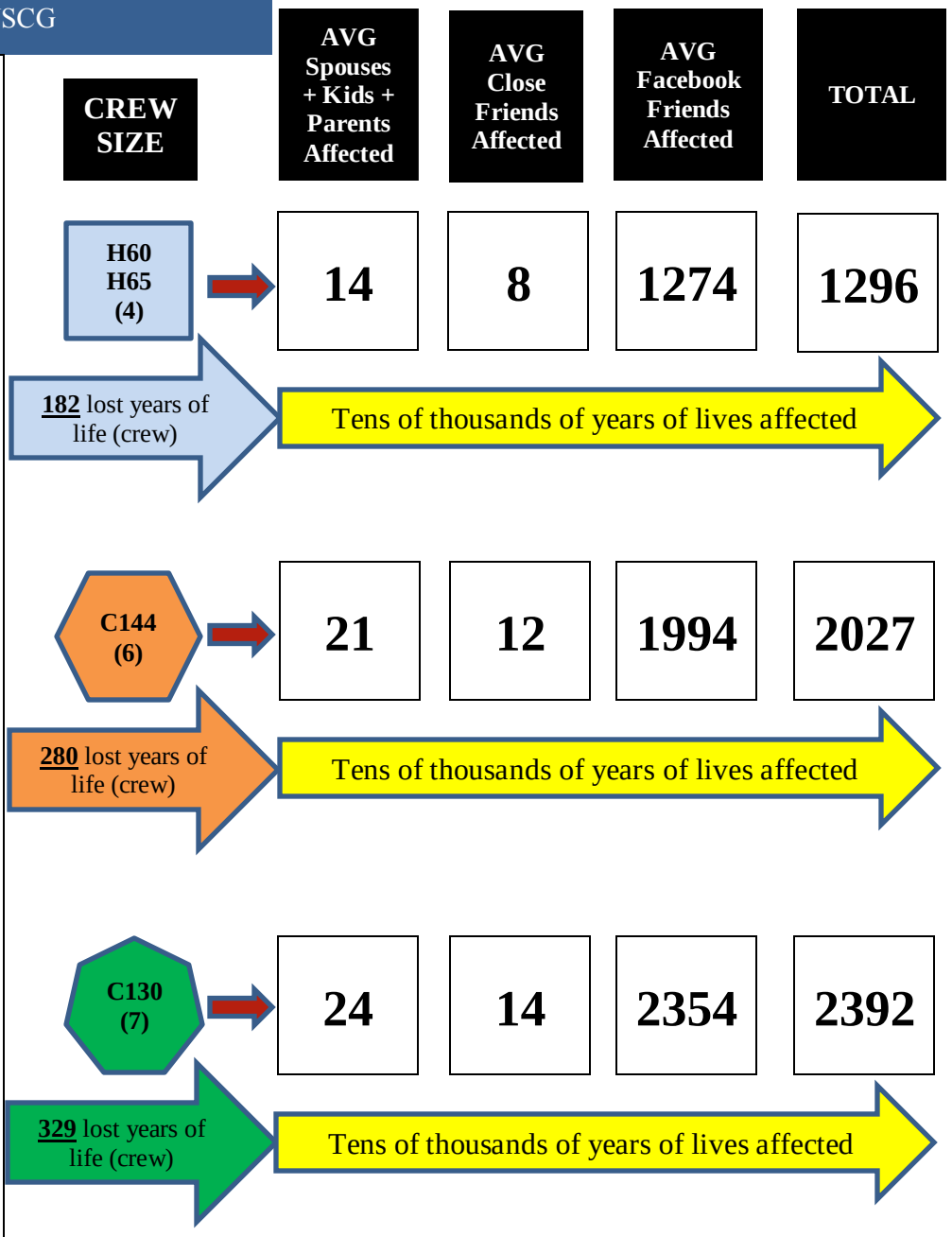
We are interested because we understand that today's small hazards could develop into tomorrow's major mishap under the right conditions. It requires broad and long-term thinking, because we all know that we can't be content with unmitigated hazards. We also seek to eliminate hazards because we genuinely care about each other, and those who will come after us.

Let's take a look at how many interested family and friends support our "average" crews and would be directly affected when a hazard grows into a Class A mishap. The data is compiled after making a few assumptions:

Avg officer age = 37; Avg enlisted age = 30
Percent married: 75% officer, 58% enlisted
Living parents of a CG member: 1.5
Avg size American family: 3
Avg person has 2 close friends
Avg 37 year-old has 277 Facebook friends
Avg 30 year-old has 360 Facebook friends
Avg American life expectancy: 79 years

Note: Extended family (aunts, uncles, nieces, etc) were not accounted for in the graphic and would make all totals higher, as would the number of fellow CG members directly or indirectly affected.

Keep finding hazards and writing reports. Thousands of people we don't even know are counting on us!



U.S. Navy CRM Instructors and CDR Jon van Buren of the Dutch Navy, taken during a recent MTT to Amsterdam. The picture was taken in Rotterdam during the Marine Corps concert.

L-R: LCDR Daniel Bennett, USN; LCDR Alvin Toney, USN; CDR Jon van Buren, RNLN; Capt Justin Hall, USMC; AWOC Trevor Godwin, USN; Maj Robert Orr, USMC

Photo provided by LCDR Alvin Toney, USN.

SMS & RISK MANAGEMENT: ROBUST MISHAP PREVENTION TOOLS

DR. BOB "OPUS" HAHN, CDR, USN (RET)

In military mishap investigations, we are doing a pretty good job of probing causal factors and asking the question, "why." That is a very useful technique for investigating the incident that occurred yesterday, two days ago, last week, or any other time in the *past*. What about the incident that possibly might occur tomorrow, two days from now, next week, or any other time in the *future*? Answering that question is the object of your Safety Management System (SMS). Specifically, the risk management pillar of your SMS can bring some tools to bear that allow your squadron to identify what can go wrong, and what the team can do about it. If you get it right, the hazard you identified and mitigated will not actuate, and no mishap will occur. This is a difficult problem. It involves asking the question "why" beforehand – an organizational approach to risk management. Do we always do a good job here?

The organizational approach to a mishap investigation is pretty clear. There are procedures and protocols that guide the process. One cannot imagine conducting a mishap investigation without utilizing the procedures and protocols we learned. The same could be said for risk management – there are practices and procedures in place; however, are we always using them? Research has shown that when we take an organizational approach to risk management, mishaps tend to *not* occur. Just a few questions the ASO might ask himself or herself may reveal just how good a job we are doing of probing hazards:

- *Is risk management a value in the organization?* Values guide decision making at all levels. Values are important to us. When an organization articulates its values, then they will likely guide peoples' decisions.
- *Do the leaders in the organization embody the values?* Is it clear to people that the CO, XO, and officers *believe* in safety? Do your actions as ASO tell people that you believe in safety? Do you practice what you preach?

If the answers to the two questions above are "yes," then you may proceed!

- *Does your squadron ask "why" for daily and future operations?* In other words, are you investigating risk like a mishap board investigates causal factors? Investigating hazards and risks should be a part of every task in the squadron's routine.
- *Do you provide guidance to your squadron in dealing with hazards and risks?* There are many ways for the team to investigate and evaluate the hazards and risks associated with the thousands of tasks we perform each day. The ASO should be the teacher.

There are many ways the ASO can provide risk management guidance. There are checklists, risk assessment worksheets tailored to squadron operations, lessons learned from the last time we did this, briefing guides for flight operations, zone inspection results, and the five ORM steps and the ABCD models. The ASO has been trained on how a small team of experts can get together and brainstorm a risk analysis that will yield good guidance for handling novel situations the squadron may face (remember the ORMx?). All these methods work. However, they beg a common denominator to make them fully effective--an SMS that guides personnel to pull these tools together in a coherent risk analysis that is robust enough to answer the question 'why' before anything bad happens!

FY14 – The Good, the Bad, and the Ugly! (continued from front page)

The GOOD. Well okay, not all of aviation had a bad year in safety in FY14. After reviewing commercial aviation it looks as if 2014 will be one of the best years in aviation safety with only 19 airliner (greater than 14 PAX) hull-losses (Class A FM) worldwide (Flight Safety Foundation). USAF had a good year as well with only 7 manned Class A flight mishaps. In the two years previous to that the mishaps were 20 and 19 respectively (AFSAS data). That is a huge drop in Air Force Class A flight mishaps. Marine Aviation also had a relatively good year dropping from a Class A flight mishap rate of 3.2 to a 4-year low of 1.94, reversing the negative trends of 2011 through 2013.

The BAD. US Army Aviation did not have a very good year in FY14. After finally achieving a sub-1.0 Class A flight mishap rate in FY13, the rate almost doubled from .81 in FY13 to 1.52 in FY14 (Oct 14 Army *Flightfax*). As stated in Flightfax "when analyzing this year's mishaps and our operational trends, two factors are immediately evident. The first is that we flew fewer flight hours during this fiscal year with a 12 percent reduction in total number of hours flown. The second factor is we reversed the trend of having more mishaps in combat than during training. In Fiscal Years 2010-13, 65 percent of the Class A mishaps occurred in combat. This year only 25 percent of the accidents occurred in combat, marking a significant shift in our operational environment and how leaders should evaluate their missions while operating at home station. A sizable percentage of the mishaps that occurred during this fiscal year can be attributed to just plain not paying attention: two incidents with UH60s ground taxiing into stationary objects, two occasions of pilots in command becoming task saturated during training and drifting into trees, one incident of an instructor pilot not managing the workload in the cockpit properly and allowing the aircraft to drift into an unsuitable landing profile and one occasion of a mid-air collision resulting from poor airspace integration." Their skill-based errors seemed to rise when flight hours were cut by 12%.

The UGLY. Navy Aviation had 14 Class A flight mishaps in FY14 (10 more than FY13). The Class A flight mishap rate went from an all-time low of .48 in FY13 to the highest rate in the last 10 years at 1.68. Before I get too far into Navy FY14 data, let's talk Naval Aviation rates to include both the Navy and Marine Corps.

The Navy and Marine Corps aviation team suffered 19 Class A flight mishaps during FY14. Of those, 9 were broadly categorized as maintenance or material-related events. This represents a marked increase in Class A flight mishaps related to maintenance & material cause factors. In the previous 5 years, less than 20 percent of aviation Class A flight mishaps fell into this category. During FY14, maintenance & material causal factor mishaps accounted for 47% of the Class A flight mishaps and aircrew human factors accounted for 53%. During FY13 those numbers were 17% for maintenance & material and 83% for aircrew human factors. The Naval Safety Center's aviation survey team is concerned, based on recent surveys saying that a culture of "doing more with less" and "cutting corners" with 4790 procedures has become more routine. This observation correlates with an increase in Class A maintenance related mishaps. There have been 6 USN Class A flight mishaps this year with primarily maintenance/material cause factors. From improper safety wiring, to installing vital components incorrectly, this normalization of deviance was causal in almost 33% of Class A flight mishaps in FY14. Additionally, Class B & C maintenance-related events also increased to 75 Class B/C events costing $12.3M.

For FY14, 2 of 9 Class A mishaps were directly attributed to maintenance. This number may increase, as there are still a couple of mishaps that are not finalized. Improper maintenance, failure to follow publications, and lack of supervision were noted. Mishap investigators are exceptional at getting to the root cause of mishaps where aircrew error was involved. However, we see SIR examples where the AMB stops asking "why" once it determines where the maintenance procedure went wrong. For example, many TFOA investigations do not discuss more than the failure of the part that fell off the aircraft. We should be analyzing compliance, supervision, etc., if they are part of the problem. Inexperience, lack of training, lack of proper tools, limited resources or poor command culture must be analyzed too. Each of these root causes require a specific, focused mitigation to ensure future mishaps are prevented. Failure to follow publications and lack of supervision are prevalent factors in most maintenance mishaps. In fact, during Aviation Safety Surveys around the fleet, we see maintenance being performed without publications in-hand or in-hand but not used.

So what will we be saying on September 30th of 2015? Will we again have a flight mishap rate below 1.0? Will Bs and Cs decline? Or, will we look back at many avoidable mishaps again. I would prefer the former. Large improvements in Naval Aviation Safety are 100% achievable in FY15. It is based on the choices we make.

That choice must be to have ROBUST practices, to be those DEDICATED people who work every day to attain BUY-IN from every CORNER of the NAVAL AVIATION ENTERPRISE! What will it be in FY15, the Good, the Bad, or the Ugly?